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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/523,463	06/13/2005	Jurgen Pawlik	15588-00020-US	7585

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EXAMINER	
HAN, KWANG S	

ART UNIT	PAPER NUMBER
1727	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/523,463	PAWLIK ET AL.	
	Examiner	Art Unit	
	Kwang Han	1727	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 September 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4,7,11,14-16,18,19,22-28,33-36 and 44-70* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4,7,11,14-16,18,19,22-28,33-36 and 44-70* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *9/8/10*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

LONG-LIFE MEMBRANE ELECTRODE ASSEMBLIES AND ITS USE IN FUEL CELLS

Examiner: K. Han SN: 10/523,463 Art Unit: 1727 November 5, 2010

Detailed Action

1. The Applicant's amendment filed on September 8, 2010 was received. Claims 2, 5, 6, 8, 9, 10, 12, 13, 17, 20, 21, 29-32, and 37-43 were cancelled. Claims 1, 7, 11, 18, 25-28, 34-35, and 44-47 were amended. Claims 49-70 were added.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Specification

3. The objection to the specification has been withdrawn in view of the Applicants amendment to the title.

Claim Objections

4. Claim 33 is objected to because of the following informalities: The status indicator is listed as "cancelled". Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 54-56, 59-61, and 64 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

7. Claims 54-56, 59-61, and 64 recites the limitation "concentration of moles of phosphoric acid" in line 2 of all the claims. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

8. The claim rejections under 35 U.S.C. 102(b) as being anticipated by Pineri on claims 1-3, 12, 14, 15, 24, and 25 are withdrawn, because the independent claim 1 has been amended.

Claim Rejections - 35 USC § 103

9. The claim rejections under 35 U.S.C. 103(a) as unpatentable over Pineri as applied to claim 1 and further in view of Cavalca et al., D'Agostino et al., Savinell et al., Bonk et al., Okamoto et al., Steck et al., and Debe et al. on claims 4-7, 8-11, 13, 16-23, 26, 28-31, 33, 34, 35-39, and 40-48 is withdrawn, because independent claim 1 has been amended and claims 2, 5, 6, 8, 9, 10, 12, 13, 17, 20, 21, 29-32, and 37-43 were cancelled.

10. Claims 1, 4, 7, 11, 14-16, 18, 19, 23-28, 33-36, 44, 45, 49, and 50-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri (WO 2002/046278 using US 2004/0058216 for translation and citation) in view of Savinell et al. (US

5525436), Cavalca et al. (US 6300000), D'Agostino et al. (US 4012303), and Bonk et al. (US 6399234).

Regarding claims 1, 15, 24, 25, 51, 52, and 53, Pineri discloses an ion conducting membrane for a fuel cell comprising polyimide layers on the two surfaces (1, 3) of the membrane forming a frame structure conferring mechanical properties on the assembly (Figure 1), surrounding the inner portions [0024] and in contact with the electrode [Abstract, 0006, 0007] with the thickness of the polyimide layer to be between 1 to 10 microns [0053]. An ion conducting membrane with electrodes used for a fuel cell forms a membrane electrode assembly. Pineri is silent towards the membrane comprising polyazoles, at least one of the polyimide layers being coated with fluoropolymers, the thickness of the fluoropolymer layer, the contact area between the polyimide layer and the electrode, and the two polyimide layers extending beyond the membrane and are in flat contact with one another.

Savinell teaches solid polymer electrolytes to be comprised of various polymers containing basic groups that can form complexes with stable acids or polymers containing acidic groups such as polyimidazoles, polybenzoxazoles, etc. to form solid polymer electrolytes which are stable and retain sufficient ionic conductivity at high temperatures (2:51-67). It would have been obvious to one of ordinary skill in the art at the time of the invention to have the electrolyte membrane to include polyazoles because Savinell teaches these polymers can form complexes with stable acids or polymers containing acidic groups to form a membrane which are stable and retain sufficient ionic conductivity at high temperatures.

Cavalca teaches the use of a hydrophobic component such as a fluoropolymer including FEP (tetrafluoroethylene/hexafluoropropylene copolymer) concentrated at the electrode-membrane interface for the benefit of improving water repellency in the electrode structure (13:18-26). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a coating or layer of a fluoropolymer because Cavalca teaches it provides for improving water repellency in the electrode structure.

D'Agostino teaches a fluoropolymer film layer (FEP) useful as a membrane for fuel cells [Abstract] having film thicknesses up to 10 mils (254 microns) to provide mechanical strength and resistance to back pressure (3:58 - 4:8). It would have been obvious to one of ordinary skill in the art at the time of the invention to have a fluoropolymer film layer to have a thickness up to 10 mils thick because D'Agostino teaches it provides mechanical strength and resistance to back pressure when used in a fuel cell assembly.

Bonk teaches a typical fuel cell assembly where the electrodes (32, 34) and the thermoplastic material completely cover the membrane (48) (Figures 1, 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to have the electrode completely cover the membrane because Bonk teaches this structure is typical for a fuel cell assembly.

Bonk further teaches a PEM fuel cell which employs thermoplastic film layers which are extended to the edge of the fuel cell components such as the proton exchange membrane which is bonded and sealed to reduce the likelihood of introducing contaminants to the membrane (8:47-57; Figure 2). It would have been obvious to one

of ordinary skill in the art at the time of the invention to use a polyimide layer to be extended beyond the membrane and to be bonded because Bonk teaches this type of film layer structure for a fuel cell seals and reduces the likelihood of introducing contaminants to the membrane.

It is noted that claim 1 includes product-by-process limitations. "Even though product-by-process are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F. 2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). The membrane electrode assembly of Pineri in view of Savinell, Cavalca, D'Agostino, and Bonk, is similar to that of the Applicant's; Applicant's method of forming a membrane electrode assembly is not given patentable weight in the claims.

Regarding claims 4, 18, and 27, the teachings of Pineri as discussed above are herein incorporated. Pineri is silent towards the electrode having an electrochemically active area whose size is at least 2 cm^2.

Cavalca teaches a fuel cell electrode assembly with examples having a 25 cm^2 active areas with a performance output values showing milliamps per unit area (22:30-63). It is well known and obvious to one of ordinary skill in the art to vary the size of the active area of the electrode for a fuel cell dependant on the power requirements for the system.

Regarding claims 7, 19, and 35, Pineri is silent towards at least one of the polyimide layers being coated with fluoropolymers.

Cavalca teaches the use of a hydrophobic component such as a fluoropolymer including FEP (tetrafluoroethylene/hexafluoropropylene copolymer) concentrated at the electrode-membrane interface for the benefit of improving water repellency in the electrode structure (13:18-26). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a coating or layer of a fluoropolymer because Cavalca teaches it provides for improving water repellency in the electrode structure.

Regarding claim 11, Pineri is silent towards a membrane doped with phosphoric acid.

Savinell teaches a proton conducting membrane for a fuel cell that is doped with phosphoric acid to about 50 wt% [Abstract] (10:8-22) for forming a polymer electrolyte membrane capable of conducting protons in temperatures excess of 100°C. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a membrane doped with phosphoric acid to 50 wt% because Savinell teaches this produces a polymer electrolyte membrane capable of conducting protons in temperatures excess of 100°C.

Regarding claims 14 and 34, Materials used for electrodes inherently have some degree of compressibility.

Regarding claims 16, 23 and 36, Pineri does not explicitly disclose the surfaces of the polymer electrolyte membrane to be completely covered by the two electrodes and the polyimide layer.

Bonk teaches a typical fuel cell assembly where the electrodes (32, 34) and the thermoplastic material completely cover the membrane (48) (Figures 1, 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to have the electrode completely cover the membrane because Bonk teaches this structure is typical for a fuel cell assembly.

Regarding claim 26, Pineri discloses the thickness of the polyimide layer to be between 1 to 10 microns [0053].

Regarding claim 28, the teachings of Pineri as discussed above are herein incorporated. Pineri teaches the electrolyte membrane to be comprised of sulphonated polyimides but is silent towards the membrane comprising polyazoles.

Savinell teaches solid polymer electrolytes to be comprised of various polymers containing basic groups that can form complexes with stable acids or polymers containing acidic groups such as polyimidazoles, polybenzoxazoles, etc. to form solid polymer electrolytes which are stable and retain sufficient ionic conductivity at high temperatures (2:51-67). It would have been obvious to one of ordinary skill in the art at the time of the invention to have the electrolyte membrane to include polyazoles because Savinell teaches these polymers can form complexes with stable acids or polymers containing acidic groups to form a membrane which are stable and retain sufficient ionic conductivity at high temperatures.

Regarding claim 33, Pineri discloses a membrane doped with phosphoric acid but is silent towards the concentration of the phosphoric acid.

Savinell teaches a proton conducting membrane for a fuel cell that is doped with phosphoric acid to about 50 wt% [Abstract] (10:8-22) for forming a polymer electrolyte membrane capable of conducting protons in temperatures excess of 100°C. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a membrane doped with phosphoric acid to 50 wt% because Savinell teaches this produces a polymer electrolyte membrane capable of conducting protons in temperatures excess of 100°C.

Regarding claim 44, Pineri discloses the ion conducting membrane to be part of a fuel cell membrane electrode assembly [Abstract].

Regarding claim 45, Pineri discloses the ion conducting membrane for a fuel cell comprising polyimide layers on the two surfaces (1, 3) of the membrane and in contact with the electrode overlapping with the electrode [Abstract, 0006, 0007].

Regarding claims 49, 50, and 54-67, it is noted that these claims are product-by-process claims. "Even though product-by-process are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F. 2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). The membrane electrode assembly of Pineri in view of Savinell, Cavalca, D'Agostino, and Bonk, is similar to that of the Applicant's; Applicant's method of forming a membrane electrode assembly is not given patentable weight in the claims.

11. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri, Savinell et al., Cavalca et al., D'Agostino et al., and Bonk et al. as applied to claim 1 above, and further in view of Okamoto et al. (JP 2001-196082, machine translation).

Regarding claim 22, Pineri discloses the polyimide layer to be on the opposing sides of the membrane but is silent towards the polyimide layers to be in contact with the separator plates.

Bonk teaches a PEM fuel cell which employs thermoplastic film layers which are extended to the edge of the fuel cell components such as the proton exchange membrane which are bonded and sealed to reduce the likelihood of introducing contaminants to the membrane (8:47-57; Figure 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a polyimide layer to be extended beyond the membrane and to be bonded because Bonk teaches this type of film layer structure for a fuel cell seals and reduces the likelihood of introducing contaminants to the membrane.

Okamoto teaches an electrode unit structure for a fuel cell which provides a polyimide seal in contact with the electrode, membrane, and the separators at the peripheral regions to provide a seal to prevent the loss of moisture and acid [0012] (Drawing 1). It would have been obvious to one of ordinary skill in the art to combine the teachings of Bonk and Okamoto to form a polyimide layer further extended as a seal in Pineri's membrane structure because Okamoto teaches that a polyimide seal prevents the loss of moisture and acid within the fuel cell structure.

12. Claims 46 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri, Savinell et al., Cavalca et al., D'Agostino et al., and Bonk et al. as applied to claims 45 and 1 above, and further in view of Steck et al. (US 5464700).

The teachings of Pineri, Savinell, Cavalca, D'Agostino and Bonk as discussed above are herein incorporated.

Regarding claims 46 and 47, Pineri is silent towards the overlap of the frame or the frame not covering the free electrode area.

Steck teaches that a gasketed membrane electrode assembly can employ gasketing material at the periphery for a specific percentage (6:64-7:34) of the ion exchange membrane rather than the membrane itself as a gasket because it provides a seal between the separator plates that is more effective and economical than assemblies employing the membrane itself [Abstract]. It would have been obvious to one of ordinary skill in the art at the time of the invention to employ a gasketing material at the periphery of the ion exchange membrane to act as a frame because Steck teaches this provides a seal between the separator plates that are more effective and economical than assemblies employing the membrane itself. It has been held that prior art which teaches a range overlapping or touching the claimed range anticipates if the prior art range discloses the claimed range with “sufficient specificity” (MPEP 2131.03).

13. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri, Savinell et al., Cavalca et al., D'Agostino et al., and Bonk et al. as applied to claim 1 above, and further in view of Debe et al. (US 6042959).

The teachings of Pineri, Savinell, Cavalca, D'Agostino, and Bonk as discussed above are herein incorporated.

Regarding claim 48, Pineri is silent towards the polyimide to contain repeating units defined by Formula VI.

Debe teaches a membrane electrode assembly which employs a composite membrane [Abstract] which includes an organic substrate which are stable at annealing temperatures, maintain integrity at high temperatures and vacuum imposed on them formed from polymers such as Kapton polyimide film (polyimide containing repeating units defined by Formula VI; 9:56-10:4). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a polyimide film formed from polymers such as Kapton polyimide in the membrane electrode assembly of Pineri because Debe teaches these polymers are stable at annealing temperatures, and maintain integrity at high temperatures and vacuum.

Response to Arguments

14. Applicant's arguments filed September 8, 2010 have been fully considered but they are not persuasive.

Applicant's principal arguments are:

(a) The applicant's polyimide is not conductive and included the coating on the instant polyimide, because such coating is non-conductive,

(b) the Applicant just has a frame and not a full coverage of the surface, and

(c) the Pineri reference uses the sulfonated polyimide in the conductive are of the MEA whereas the Applicant uses it as a gasket material.

In response to Applicant's arguments, please consider the following comments:

(a) In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., non-conductive) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993),

(b and c) the limitations to independent claim 1 do not require a gasketing material or a frame defining less than full coverage. The drawing as shown in the Applicant's response cannot be used to further define the use of the term "frame" in the claims, whether evidenciary or not, as it is not part of the original disclosure. The rejection as presented above meets the limitations of the claim requiring polyimide layers on each surface of the electrolyte membrane in a frame structure which overlaps.

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact/Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kwang Han whose telephone number is (571) 270-5264. The examiner can normally be reached on Monday through Friday 8:00am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on (571) 272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. H./
Examiner, Art Unit 1727

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 1727